

# WACA/WSDOT Meeting Minutes

## Attendees:

Jim Walter, WSDOT	Steve Ford, Miles Sand &G	Craig Matteson, Central Pre
Kurt Williams, WSDOT	Don Brouillard, WSDOT	Robert Raynes, Rinker
Kurt Siegfried, Rinker	Cathy Nicholas, FHWA	Dave Heizenrader, WSDOT
Steve Hiester, Utility Vault	Tom Weist, Utility Vault	Jim Tobin, NW ACPA
Ivan Scott, Texada	John Tellvik, Degussa	Gary Albert, Martin Marietta
Kevin Wolf, Glacier NW	Kent Balcom, Headwaters	Neil Guptill, Glacier NW
Rob Shogren, Lafarge		

Day/Time: Thursday, January 26, 2006, 9:30 AM – 12:00 Noon.

Location: WSDOT, HQ Materials Laboratory

## **Meeting Minutes:**

**Date for Next WACA Meetings:** Thursday, March 30<sup>th</sup> – WACA's office in Des Moines, 9:30 AM – 12:00 Noon

Future WACA Meetings Dates:

Thursday, May 25<sup>th</sup> – WSDOT HQ Mats Lab

Future Proposed Meeting Dates:

*October 12, 2006 at WACA's office Des Moines*

*December 7, 2006 at WSDOT HQ Mats Lab*

## **Issue: Fly Ash, supply and being able to meet WSDOT Std Spec – Kent Balcom.**

*01/26/06 – Kent Balcom noted that Headwaters silos now hold 21,000 tons of fly ash and are capable of holding 55,000 tons. The winter months had a higher than expected demand for fly ash and Centralia power plant is not running at full capacity due to the amount of hydro power available. Ken expects to have more information in the next couple weeks.*

***Action Plan: Update group at next WACA meeting on status of fly ash supply and ability to meet WSDOT Std Spec. – Kent B.***

## **Issue: Percent Slag allowed in concrete, Sect 6 and 5 of the Std Specs – Rob Shogren.**

*01/26/06 – Kurt noted this issue is deferred until the alumina in slag issue is dealt with, which is covered later in these minutes.*

***Action Plan: Update this issue at next WACA meeting – Jim W./Kurt W.***

**Issue: Viscosity Modifying Admixture – Mo Sheikhzadeh.**

01/26/06 – Kurt noted that Mo S. was unable to attend today. Tom Weist said that his company, (Utility Vault), had been working with Mo to get their SCC mix approved. Tom noted that the mix didn't use a VMA, but was not allowed by the Std Specs, due to slump restrictions. Tom asked what needed to be done to get SCC approved. Kurt said he would have Mo get in contact with Tom Weist. Note: Mo contacted Tom Weist that day to discuss what was needed, column segregation test, and Tom and Mo are working out the details for the test requirements.

***Action Plan: Continue to give updates to WACA at next Meeting. – Mo S.***

**Issue: Shrinkage Strain – Mo Sheikhzadeh.**

Issue: Cracking in bridge decks. WSDOT is seeing transverse cracks every 4 to 6 feet in bridge decks, even when the bridge decks are properly cured. Test mix has approximately 350 pounds of cement, and with fly ash the total cementitious content is 560 pounds.

01/26/06 – Kurt deferred this issue as Mo was not at the meeting.

***Action Plan: Continue to give updates to WACA at Monthly Meetings. – Mo S.***

**Issue: Slag as an alternative on 4000D and 4000P concrete mixes - Mo Sheikhzadeh & High Alumina content in slag & potential for sulfate attack – Kurt W./Jim W.**

Issue: WSDOT is concerned that high alumina slag will not mitigate for sulfate attack.

01/26/06 – Kurt handed out information on the amount of sulfates found in deicing chemicals used by WSDOT. Kurt noted that at this point, there was no consensus within WSDOT on what this information means, but there is still a concern with the potential for deicing chemicals to cause sulfate attack. Kurt said that he would be working with Rob Shogren with Lafarge to identify next steps on this issue.

***Action Plan: Continue to give updates to WACA at Monthly Meetings – Mo S.***

**Issue: Unique number for concrete mix design: Jim Walter/Don Brouillard**

Issue: Jim W noted briefly that there is a problem with the same Unique concrete mix design number being used for concrete mix designs from different concrete batch plants using different aggregate sources. Asked all to look into this and noted that a unique mix design number is required when different aggregate sources and plants are used.

01/26/06 – Don B noted that the expected the update adding a space for plant identification to the concrete mix design form should be ready in February. This form will be available on line.

***Action Plan: Issue complete.***

**Issue: Bituminous Surface Treatment (BST) –Jim W.**

*01/26/06 – Jim Walter noted that the internal WSDOT meeting on BST's has not happened yet. Jim said that each WSDOT Region is expected to develop its own BST specification and work is expected this year to move toward a state wide BST specification. Jim recommended that interested industry representatives contact the Regions they are working with to get information on what the Region BST specification will be.*

***Action Plan: Continue to give updates to WACA at Monthly Meetings – Jim W.***

**Issue: Section 6-2.2A Prequalification Inspection – Kurt W.**

Propose to use National Ready Mix Concrete Association (NRMCA) batch plant inspection guidelines. Delete WSDOT Plant Inspection checklist.

*01/26/06 – Kurt handed out the latest update Section 6-02.3(4)A Qualification of Batch Plant Suppliers for review. Dave H. noted that several PE offices are having problems getting NRMCA cover sheets from concrete suppliers. Kurt asked for comments back on the specification in 2 weeks. Note: This specification has been modified with further input and is attached at the bottom of this email.*

***Action Plan: Continue to give updates to WACA at Monthly Meetings. – Kurt W.***

**Issue: Minimum Cement Content for Commercial Concrete – Mo S./ Steve W.**

Specification requirement for commercial concrete has minimum cement content at 564 pounds, with no tolerance below that level. Specification clarification needed?

*01/26/06 – Kurt handed out a copy of the 2006 Std Spec, Section 6-02.3(2)B which notes that the tolerances of Section 6-02.3(5)C shall apply. Kurt noted that no one has asked, but he expects the aggregate tolerances Section 6-02.3(5)C of would apply to commercial concrete also.*

***Plan: Issue Complete***

**Issue: Cold Weather Temp. Requirements for Concrete, Section 6-02.3(6)A Mo S./ Steve W.**

*Issue: Section 6-02.3(6)A, "The Contractor shall not mix nor place concrete while the air temperature is below 35° F, unless the water or aggregates (or both) are heated to at least 70° F." This is being interpreted in the field to mean that the concrete arriving on site must be at least 70° F.*

*01/26/06 – Kurt handed out a copy of the Construction Manual, Section 6-2.3A(1) Weather and Temperature Limitations. Kurt noted that this section clarifies that the temperature for cast in place concrete must be between 55 degrees F and 90 degrees F. Also, Std Spec, Section 6-02.3(2)D has this same temperature requirement. Kurt*

*recommended pointing WSDOT inspector's to that information and have them contact the HQ construction office if this is still an issue.*

***Plan: Issue Complete***

**Issue: Performance Specifications for Concrete Mix Designs - Mo Sheikhezadeh**

Issue: Develop performance specification parameters for concrete that can be developed into specifications.

*01/26/06 – Kurt differed this issue as Mo was not at the*

***Plan: Update WACA at Monthly Meetings. – Mo S.***

**Issue: Degradation for concrete Aggregate/Base Course – Jim Walter.**

*01/26/06 – Jim Walter reviewed WSDOT's proposal to apply a degradation requirement to concrete aggregates. Jim noted that WSDOT has moved away from the Steilacoom comparison and WSDOT needs to ensure that concrete aggregate will not degrade. The group discussed this issue at length and the following are excerpts: Ivan Scott asked if water affected the aggregate in concrete? Jim W reviewed aggregate used from Black Lake pit that degraded in a rockery wall and that he expected the aggregate would degrade in concrete. Craig M noted that at his company's pits, preliminary degradation test show pit run is 68% less than the processed ¾ round rock. Craig Matteson made the comment that the shaker rpm specified for the degradation test was hard to match with common equipment available. Robert Raynes said that the equipment was available from ELE International, and that ELE made a special WSDOT model to meet the spec. Kurt S asked about isolating the marine basalt if that is the problem aggregate and Jim W responded that other types of aggregate are a problem. Robert Raynes discussed the degradation test at length and this is covered in Rinker's letter handed out at the meeting. Kurt W noted that he had forwarded this letter to Jim Walter and Jim Spaid. Jim W. said he is moving forward with applying the degradation requirements to concrete aggregates. The group discussed the degradation issues further and the industry does not support having a degradation requirement on concrete aggregate as currently proposed. Industry is concerned that the degradation test is an in or out test and there is no mitigation test such as used with ASR. Industry discussed using the degradation test as a screening test for concrete aggregate, with further test being utilized as referee test.*

***Action Plan: Continue to give updates to WACA at Monthly Meetings. – Jim W.***

**New Issues:** No New Issues were presented at this meeting.

**Reminders:**

Cure Boxes Specification – April 1, 2005 Amendments to the Std Specs. Kurt W./Jim W.  
ASR flow chart - July 2006 Amendment to the construction manual. Don B/Kurt W.

## **Handout on Self Consolidating Concrete**

The following test results along with mix design shall be provided:

### Properties of Fresh SCC

1. Unit weight (Lb/ft<sup>3</sup>)
2. Concrete temp (F)
3. Air content % (ASTM C231)
4. Slump flow (in) (ASTM C1611)
5. Visual stability index
6. Flow rate & viscosity, T50 (sec)
7. "J"-Ring flow
8. "U" Box
9. "L" box
10. Column segregation

### Properties of Hardened Concrete

1. Compressive Strength (1, 3, 7 & 28 days)
2. Modulus of elasticity (ksi)
3. Shrinkage (ASTM C157)

## **Update to Section 6-02.3(4)A Qualification of Concrete Suppliers**

### **6-02.3(4)A Qualification of Concrete Suppliers**

Batch Plant Prequalification may be obtained through one of the following methods:

1. Certification by the National Ready Mix Concrete Association (NRMCA). Information concerning NRMCA certification may be obtained from the NRMCA at 900 Spring Street, Silver Springs, MD 20910 or online at [www.nrmca.org](http://www.nrmca.org). The NRMCA certification shall be good for a two year period. When this method of certification is used the following documentation shall be submitted to the project engineer.
  - a. A copy of the current NRMCA Certificate of Conformance, the concrete mix design(s) (WSDOT Form 350-040), along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification.
2. Independent evaluation certified by a Professional Engineer using NRMCA checklist. The Professional Engineer shall be licensed under title 18 RCW, state of Washington, qualified in civil engineering. The independent certification using the NRMCA checklist shall be good for a two year period. When this method of certification is used the following documentation shall be submitted to the engineer.
  - a. A copy of the Professional Engineer's stamped and sealed NRMCA Verification of Inspection and Application for Certificate page from the NRMCA checklist, the concrete mix design(s) (WSDOT Form 350-040), along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification.
3. Inspection conducted by the Plant Manager, defined as the person directly responsible for the daily plant operation, using the NRMCA Plant Certification checklist. The Plant Manager certification shall be done prior to the start of a project, and every six months throughout the life of the project, and meet the following requirements:
  - a. The Agreement to Regularly Check Scales and Volumetric Batching Dispensers page in the NRMCA Plant Certification checklist shall be signed by the Plant Manager and notarized.
  - b. The signed and notarized Agreement to Regularly Check Scales and Volumetric Batching Dispensers page and a copy of the NRMCA Plant Certification checklist cover page showing the plant designation, address and Company operating plant shall all be submitted to the Project Engineer with the concrete mix design (WSDOT Form 350-040), along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification.
  - c. The NRMCA Plant Certification checklists shall be maintained by the Plant Manager and are subject to review at any time by the Contracting Agency.
  - d. Volumetric water batching devices (including water meters) shall be verified every 90 days.

For central-mixed concrete, the mixer shall be equipped with a timer that prevents the batch from discharging until the batch has been mixed for the prescribed mixing time. A mixing time of one minute will be required after all materials and water have been introduced into the drum. Shorter mixing time may be allowed if the mixer performance is tested in accordance with (AASHTO M 157 Annex A1 Concrete Uniformity Requirements). Tests shall be conducted by an independent testing lab or by a commercial concrete producer's lab. If the tests are performed by a producer's lab, the Engineer or a representative will witness all testing.

### 6-02.3(2)B Commercial Concrete

Commercial concrete shall have a minimum compressive strength at 28 days of 3000 psi in accordance with WSDOT FOP for AASHTO T 22. Commercial concrete placed above the finished ground line shall be air entrained and have an air content from 4.5 percent to 7.5 percent per WAQTC FOP for AASHTO T 152. Commercial concrete does not require plant approval, mix design, or source approvals for cement, aggregate, and other admixtures.

Where concrete Class 3000 is specified for nonstructural items such as, culvert headwalls, plugging culverts, concrete pipe collars, pipe anchors, monument cases, luminaire bases, pedestals, cabinet bases, guardrail anchors, sign post foundations, fence post footings, sidewalks, curbs, and gutters, the Contractor may use commercial concrete. If commercial concrete is used for sidewalks, curbs, and gutters, it shall have a minimum cementitious material content of 564 pounds per cubic yard of concrete, shall be air entrained, **and the tolerances of Section 6-02.3(5)C shall apply.** Commercial concrete shall not be used for structural items such as, bridges, retaining walls, box culverts, or foundations for high mast luminaires, mast arm traffic signals, cantilever signs, and sign bridges. The Engineer may approve other nonstructural items not listed for use as commercial concrete.

### 6-02.3(5)C Conformance to Mix Design

Cement, coarse and fine aggregate weights shall be within the following tolerances of the mix design:

Batch Volumes less than or equal to 4 cubic yards		
Cement	+5%	-1%
Aggregate	+10%	-2%
Batch Volumes more than 4 cubic yards		
Cement	+5%	-1%
Aggregate	+2%	-2%

If the total cementitious material weight is made up of different components, these component weights shall be within the following tolerances:

1. Portland cement weight plus 5% or minus 1 percent of that specified in the mix design.
2. Fly ash weight plus or minus 5 percent of that specified in the mix design.
3. Microsilica weight plus or minus 10 percent of that specified in the mix design.

Water shall not exceed the maximum water specified in the mix design.

Shear keys in construction joints shall be formed with 1½-inch (40 millimeter) thick lumber and shall be constructed the full size shown in the plans. For box girder webs, these shear keys are normally shown in the plans to be full width between stirrups. The specifications require shear key forms to be left in place at least 12 hours after the concrete has been placed. The plans will indicate certain joints to have a roughened surface. These joints shall be finished and prepared for the next pour in accordance with the instructions given in the specifications or as shown in the plans.

Expansion dams or the expansion dam blockout shall be carefully placed before concreting the roadway decks. They shall also be carefully aligned for crown and grade.

Blockouts for expansion joint seals must be carefully formed to the dimensions shown in the plans for proper placement and operation. Be sure to check that the rebar in the blockout does not conflict with the expansion joint anchors. The joint seal must be placed using a lubricant adhesive.

Concrete shall be placed in accordance with the requirements of Section 6-02.3(6) of the *Standard Specifications*. The Inspector should be alert to see that any method of placing concrete that causes segregation of the concrete mix be discontinued. Some of the conveyor belt systems tend to cause segregation of the mix after several exchanges from one belt to another. The Inspector shall see that the length of conveyor belt is limited so segregation does not occur. Aluminum pipe or sheeting shall not be used in contact with fresh concrete.

In heavily reinforced sections, the maximum concrete slump may be increased 2 inches (50 millimeters) with the use of a high range water reducer, as discussed in Section 6-02.3(4)C of the *Standard Specification*. It is anticipated that possible candidates for this increase of concrete slump may be columns, cross-beams, and post-tensioned box girder web walls and other heavily reinforced members.

### 6-2.3A(1) Weather and Temperature Limits

Concrete may **not** be placed when rain is hard enough to:

- Cause a muddy foundation.
- Wash or flow the concrete.

The temperature of the concrete for cast-in-place concrete must be between 55 F (13°C) and 90 F (32°C) during placement. The temperature for precast concrete that is heat cured must be between 50 F (10°C) and 90 F (32°C).

The air temperature must be at least 35 F (2°C) during and for seven days after placement (unless the contractor has an approved cold weather plan).

The temperature measuring device shall be capable of measuring the temperature of freshly mixed concrete to ±1 F (±1°C) with a range of 0 F to 130 F (-18°C to 54°C).

### Hot Weather Placement (Air Temperature Above 90 F (32°C))

- Cool the component materials of the mix, transport and placement equipment, and the contact surfaces at the site.
- Methods shall be preapproved by the Engineer.

### Cold Weather Placement

- Concrete shall not be placed against any frozen or ice-coated foundation, forms, or reinforcement.
- A preapproved plan for cold weather placement and curing is required, if temperatures are below 35 F (2°C) or anticipated to be below 35 F (2°C) in the next seven days.
- Heat aggregate and/or water to maintain mix temperatures above 55 F (13°C).
- Control temperature and humidity after placement by:
  - Enclosing concrete.
  - Heating to 50 F to 90 F (10°C to 32°C) for seven days.
  - Add moisture for six days (discontinue 24 hours before heat is stopped).
  - An accurate recording thermometer is required.
  - Corners and edges require special attention to prevent freezing.

When heating water and aggregates, the approximate resulting temperature for a batch of concrete can be estimated from the following formula:

$$X = \frac{Wt + 0.22 W't'}{W + 0.22 W'}$$

Where

- X = temperature of the batch
- W = weight (mass) of the water
- W' = weight (mass) of the aggregates and cement
- t = temperature of the water in degrees F
- t' = temperature of the aggregates and cement

### 6-2.3A(2) Acceptance of Concrete

The Contractor is required to provide a certificate of compliance for each load of concrete delivered to the job. Based on who is supplying the mix, the format of the certification may vary. All certifications must contain

Sulfur and Sulfate Content of WSDOT Deicers				
Category	Liquid/Solid	Product Name	% Sulfur	% Sulfate (SO4)
Corrosion Inhibited NaCl	Solid	Clear Lane	0.01	0.03
Corrosion Inhibited NaCl	Solid	Ice Slicer Elite	0.02	0.06
Magnesium Chloride	Liquid	FreezGard	0.12	0.36
Calcium Chloride	Liquid	Geomelt	0.04	0.12



January 26, 2006

Mr. Kurt Williams  
Assistant Roadway Construction Engineer  
Washington State Department of Transportation  
Headquarters Construction Office  
310 Maple Park Avenue SE  
PO Box 47354, Olympia, WA 98504-7354

**Subject: Sources of Variations in WSDOT Test Method T 113**  
*Method of Test for Determination of Degradation Value*

Gentlemen:

As you requested, this letter is a brief overview of sources of variation in the above-mentioned Washington Degradation Test (WDT). This letter is a follow up of the joint task group meeting between WACA and WSDOT on January 11, 2006. The primary focus of the meeting was to discuss the Aggregate Degradation Review, final report authored by KBA, dated December 21, 2005.

Of great concern to WACA members is the recommendation to add a degradation conformance measure to concrete aggregate standards. After carefully reading the report, I asked for and received the referenced materials used in the preparation of the report. No recommendation in any of the referenced documents suggests the inclusion of concrete aggregates for wet degradation and attrition tests for the identification and production of plastic fines. It is obvious that the mechanism that the test procedure strives to model involves movement not found in aggregates bound in concrete. I believe, as do many of the WACA group (representing the majority of the industry), that the inclusion of concrete aggregates for degradation standards is inappropriate and unsubstantiated.

I think we all have a fair understanding of how the test method is performed and the WSDOT explanation of why the test method is needed. One of the referenced documents pretty much sums up what we all agree to be true. In ASTM Technical Publication 169B, "Significance of Test and Properties of Concrete and Concrete Making Materials", chapter 38, Abrasion Resistance, Strength, Toughness and Related Properties, Meininger states the following on page 683:

"It has been known that some aggregates degrade in a different manner in the presence of water than that exhibited in dry test methods [68]. For concrete aggregates the principal value of such tests are identification of aggregates which may create undesirable fines during handling, batching and mixing which could affect concrete properties such as strength and water requirements. These tests perhaps have more significance for base course and aggregate surfaced roads where the possibility of interparticle movement in the presence of water may occur over the period of service of the material."

This statement is contrary to the recommendation for adoption of the WDT for concrete aggregates. The "principal value" mentioned above is dealt with as a matter of daily practice by all commercial suppliers of concrete. We need to keep working towards performance specification and away from prescriptions.

Rinker Materials

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## Sources of Variations in WSDOT Test Method T 113

January 26, 2006

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Also found in the same referenced document on page 685, and needing discussion, is a paragraph that touches on disturbing factors about sources of variation in the WDT test method. This section was particularly interesting to me because I can vouch for the validity of the author's comments from our experience working with the test method. First let me quote the paragraph, and then I will elaborate on points of interest.

"Goonewardane [79] in recent work with the Washington degradation test looked into sources of variation. He concluded that both surface attrition and leaching clays from the aggregate pores were involved in the test. The value obtained is very dependent on the surface area of the charge and finer samples will indicate more degradation. Aggregate quality improved with repeated agitation cycles as found by Hveem [78]. Weathered basalt was found to produce lower durability results than fresh basalt."

Before we even get the sample into the laboratory for evaluation, we need to look at the practice of sampling the source for qualification. The initial field sample procured has an enormous impact on the results of the durability factor (DF) achieved in the lab. The initial gradation and resulting surface area of the raw aggregates obtained affect the percentages of clay fine introduced into the resulting test sample. Fifty pounds of 2-inch rocks have a greater surface area than fifty pounds of 4-inch cobbles. The surface of the stone can contain pores filled with clays or have a weathered rind that will affect the DF when abraded off by the test procedure. Crushing the materials and testing the resulting samples proves this to be true. If the WDT were a measure of only innate aggregate quality, we wouldn't be able to radically affect the results of DF by modification of surface area. The mean diameter of the particles within the test also affects the results, as reported by Goonewardane.

In Goonewardane's study he prepared samples of weathered basalt and fresh basalt from the same source. Comparable samples ranged from a DF of 3 for weathered to 80 for fresh. So the selection of the initial materials is of obvious importance to the WDT result.

Management of a resource's attributes plays a role in production of all materials. The materials supplier can have an enormous impact on the quality of the resulting aggregates for base products, asphalt products and concrete products. Selection of raw feed at the source can be used to "high-grade" materials for appropriate use. Processing methods can be implemented to beneficiate materials too. So finished product testing for compliance should be viewed by the DOT as equal to source approval. This practice should be rewarded not penalized. A means of representative production sampling is needed instead of only approving finished stockpiles of materials. This will promote an honest way of doing business.

I'll finish with the concluding remarks from the same referenced ASTM article...

"There is a good deal of history and data available concerning the measurement of physical properties of aggregates and attempts to relate these properties with concrete properties. However, the evaluation and testing of concrete containing alternative materials remains the best approach to assuring performance when special abrasion, strength or toughness properties are needed."

We have found this to be true in the case of sodium sulfate soundness testing in Oregon. The composite material (concrete) is greater than the sum of the components.

Sincerely,



Robert Raynes  
Regional Manager of Technical Services, Rinker Materials